Amendments to the Claims

Please amend Claims 17, 37 and 42. The Claim Listing below will replace all prior versions of the claims in the application:

Claim Listing

1. (original) An apparatus for determining changes in the shape of an object comprising:

an electromagnetic radiation source coupled to the object, the electromagnetic radiation source emitting a shaped beam, and

an array of electromagnetic radiation sensors coupled to the object to receive radiation from the radiation source, responses of the sensors indicating angular orientation of the shaped beam with respect to the array.

2. (original) The apparatus of Claim 1 wherein the responses of the sensors indicate a displacement of the shaped beam with respect to the array.

3. (original) The apparatus of Claim 2 wherein the shaped beam has a substantially cross-shaped cross-section.

4. (original) The apparatus of Claim 1 wherein the electromagnetic radiation source is a laser.

5. (original) The apparatus of Claim 1 wherein the electromagnetic radiation source is an electromagnetic-radiation-emitting diode.

6. (original) The apparatus of Claim 1 wherein the electromagnetic radiation source comprises at least two electromagnetic radiation sources.

7. (original) The apparatus of Claim 1 further comprising a processor processing the responses of the sensors to determine bend and twist of the object.

8. (original) The apparatus of Claim 1 wherein the array of electromagnetic radiation sensors is non-linear.

9. (original) The apparatus of Claim 1 further comprising an electromagnetic radiation focusing device positioned between the electromagnetic radiation source and the array of electromagnetic radiation sensors.

10. (original) The apparatus of Claim 1 wherein the electromagnetic radiation is infrared, visible, or ultraviolet light.

11. (original) The apparatus of Claim 1 wherein the object is a blade.

12. (original) The apparatus of Claim 1 further comprising

a second electromagnetic radiation source coupled to the object, the second electromagnetic radiation source emitting a second shaped beam, and

a second array of electromagnetic radiation sensors coupled to the object to receive radiation from the second radiation source, responses of the sensors of the second array indicating orientation of the second shaped beam with respect to the second array.

13. (original) The apparatus of Claim 12 wherein the object is a blade.

14. (original) The apparatus of Claim 12 wherein the first shaped beam and the second shaped beam are substantially co-directed.

15. (original) The apparatus of Claim 12 wherein the first shaped beam and the second shaped beam are substantially counter-directed.

16. (original) The apparatus of Claim 1 wherein the changes in shape of the object are indicative of flow of a fluid around the object.

17. (currently amended) An apparatus for determining changes in the shape of an object comprising

a first electromagnetic radiation source coupled to the object, the first electromagnetic radiation source emitting a first beam,

a first array of electromagnetic radiation sensors coupled to the object to receive radiation from the first radiation source, responses of the sensors of the first array indicating angular orientation of the first beam with respect to the first array,

a second electromagnetic radiation source coupled to the object, the second electromagnetic radiation source emitting a second beam, and

a second array of electromagnetic radiation sensors coupled to the object to receive radiation from the second radiation source, responses of the sensors of the second array indicating angular orientation of the second beam with respect to the second array;

the second radiation source being axially displaced along a length of the object with respect to the first radiation source and the second array of sensors being axially displaced along a length of the object with respect to the first array of sensors to provide a combined indication of changes in the shape of the object.

18. (original) The apparatus of Claim 17 wherein the object is a blade.

19. (original) The apparatus of Claim 17 wherein the first beam and the second beam are substantially counter-directed.

20. (original) A blade comprising

an electromagnetic radiation source coupled to the blade, the electromagnetic radiation source emitting a beam, and

an array of electromagnetic radiation sensors coupled to the blade to receive radiation from the radiation source, responses of the sensors indicating orientation of the beam with respect to the array.

21. (original) A method for determining changes in the shape of an object comprising:

emitting a shaped beam from an electromagnetic radiation source coupled to the object, and

determining angular orientation of the shaped beam with respect to an array of electromagnetic radiation sensors coupled to the object to receive radiation from the radiation source, using responses of the sensors.

22. (original) The method of Claim 21 further comprising determining displacement of the shaped beam with respect to the array using responses of the sensors.

23. (original) The method of Claim 21 wherein the shaped beam has a substantially cross-shaped cross-section.

24. (original) The method of Claim 21 wherein the electromagnetic radiation source is a laser.

25. (original) The method of Claim 21 wherein the electromagnetic radiation source is an electromagnetic-radiation-emitting diode.

26. (original) The method of Claim 21 wherein the electromagnetic radiation source comprises at least two electromagnetic radiation sources.

27. (original) The method of Claim 21 further comprising processing the responses of the sensors to determine bend and twist of the object.

28. (original) The method of Claim 21 wherein the array of electromagnetic radiation sensors is non-linear.

29. (original) The method of Claim 21 further comprising focusing the electromagnetic radiation using a focusing device positioned between the electromagnetic radiation source and the array of electromagnetic radiation sensors.

30. (original) The method of Claim 21 wherein the electromagnetic radiation is infrared, visible, or ultraviolet light.

31. (original) The method of Claim 21 wherein the object is a blade.

32. (original) The method of Claim 21 further comprising

emitting a second shaped beam from a second electromagnetic radiation source coupled to the object, and

determining orientation of the second shaped beam with respect to a second array of electromagnetic radiation sensors coupled to the object to receive radiation from the second radiation source, using responses of the sensors of the second array.

33. (original) The method of Claim 32 wherein the object is a blade.

34. (original) The method of Claim 32 wherein the first shaped beam and the second shaped beam are substantially co-directed.

35. (original) The method of Claim 32 wherein the first shaped beam and the second shaped beam are substantially counter-directed.

36. (original) The method of Claim 21 wherein the changes in shape of the object are indicative of flow of a fluid around the object.

37. (currently amended) A method for determining changes in the shape of an object comprising

emitting a first beam from a second electromagnetic radiation source coupled to the object,

determining angular orientation of the first beam with respect to a first array of electromagnetic radiation sensors coupled to the object to receive radiation from the first radiation source, using responses of the sensors of the first array,

emitting a second beam from a second electromagnetic radiation source coupled to the object, and

determining angular orientation of the second beam with respect to a second array of electromagnetic radiation sensors coupled to the object to receive radiation from the second radiation source, using responses of the sensors of the second array;

the second radiation source being axially displaced along a length of the object with respect to the first radiation source and the second array of sensors being axially displaced along a length of the object with respect to the first array of sensors to provide a combined indication of changes in the shape of the object.

38. (original) The method of Claim 36 wherein the object is a blade.

39. (original) The method of Claim 36 wherein the first beam and the second beam are substantially counter-directed.

40. (original) A method to determine changes in the shape of a blade comprising

emitting a beam from an electromagnetic radiation source coupled to the blade, and

determining orientation of the beam with respect to an array of electromagnetic radiation sensors coupled to the blade to receive radiation from the radiation source, using responses of the sensors.

41. (original) An apparatus for determining changes in the shape of an object comprising:

a means for emitting a shaped beam of electromagnetic radiation, the means for emitting electromagnetic radiation being coupled to the object, and

an array of means for sensing electromagnetic radiation, the array being coupled to the object to receive radiation from the means for emitting electromagnetic radiation, responses of the means for sensing electromagnetic radiation indicating orientation of the shaped beam with respect to the array.

42. (currently amended) An apparatus for determining changes in the shape of an object comprising:

a first means for emitting a first beam of electromagnetic radiation, the first means for emitting electromagnetic radiation being coupled to the object,

a first array of means for sensing electromagnetic radiation, the first array being coupled to the object to receive radiation from the first means for emitting electromagnetic radiation, responses of the means for sensing electromagnetic radiation of the first array indicating angular orientation of the first beam with respect to the first array,

a second means for emitting a second beam of electromagnetic radiation, the second means for emitting electromagnetic radiation being coupled to the object, and

a second array of means for sensing electromagnetic radiation, the second array being coupled to the object to receive radiation from the second means for emitting electromagnetic radiation, responses of the means for sensing electromagnetic radiation of the second array indicating angular orientation of the second beam with respect to the second array;

the second means for emitting a second beam of electromagnetic radiation being axially displaced along a length of the object with respect to the first means for emitting a first beam of electromagnetic radiation and the second array of means for sensing electromagnetic radiation being axially displaced along a length of the object with respect to the first array of means for sensing electromagnetic radiation to provide a combined indication of changes in the shape of the object.

43. (original) A blade comprising

a means for emitting a beam of electromagnetic radiation, the means for emitting electromagnetic radiation being coupled to the blade, and

an array of means for sensing electromagnetic radiation, the array being coupled to the blade to receive radiation from the means for emitting electromagnetic radiation, responses of the means for sensing electromagnetic radiation indicating orientation of the beam with respect to the array.

44. (original) An apparatus for determining flow of a fluid around an object comprising

an electromagnetic radiation source coupled to the object, the electromagnetic radiation source emitting a beam, and

an array of electromagnetic radiation sensors coupled to the object to receive radiation from the radiation source, responses of the sensors indicating orientation of the beam with respect to the array.

45. (original) A method for determining flow of a fluid around an object comprising

emitting a beam from an electromagnetic radiation source coupled to the object, and

determining orientation of the beam with respect to an array of electromagnetic radiation sensors coupled to the object to receive radiation from the radiation source, using responses of the sensors.

46. (original) An apparatus for determining flow of a fluid around an object comprising

a means for emitting a beam of electromagnetic radiation, the means for emitting electromagnetic radiation being coupled to the object, and

an array of means for sensing electromagnetic radiation, the array being coupled to the object to receive radiation from the means for emitting electromagnetic radiation, responses of the means for sensing electromagnetic radiation indicating orientation of the beam with respect to the array.